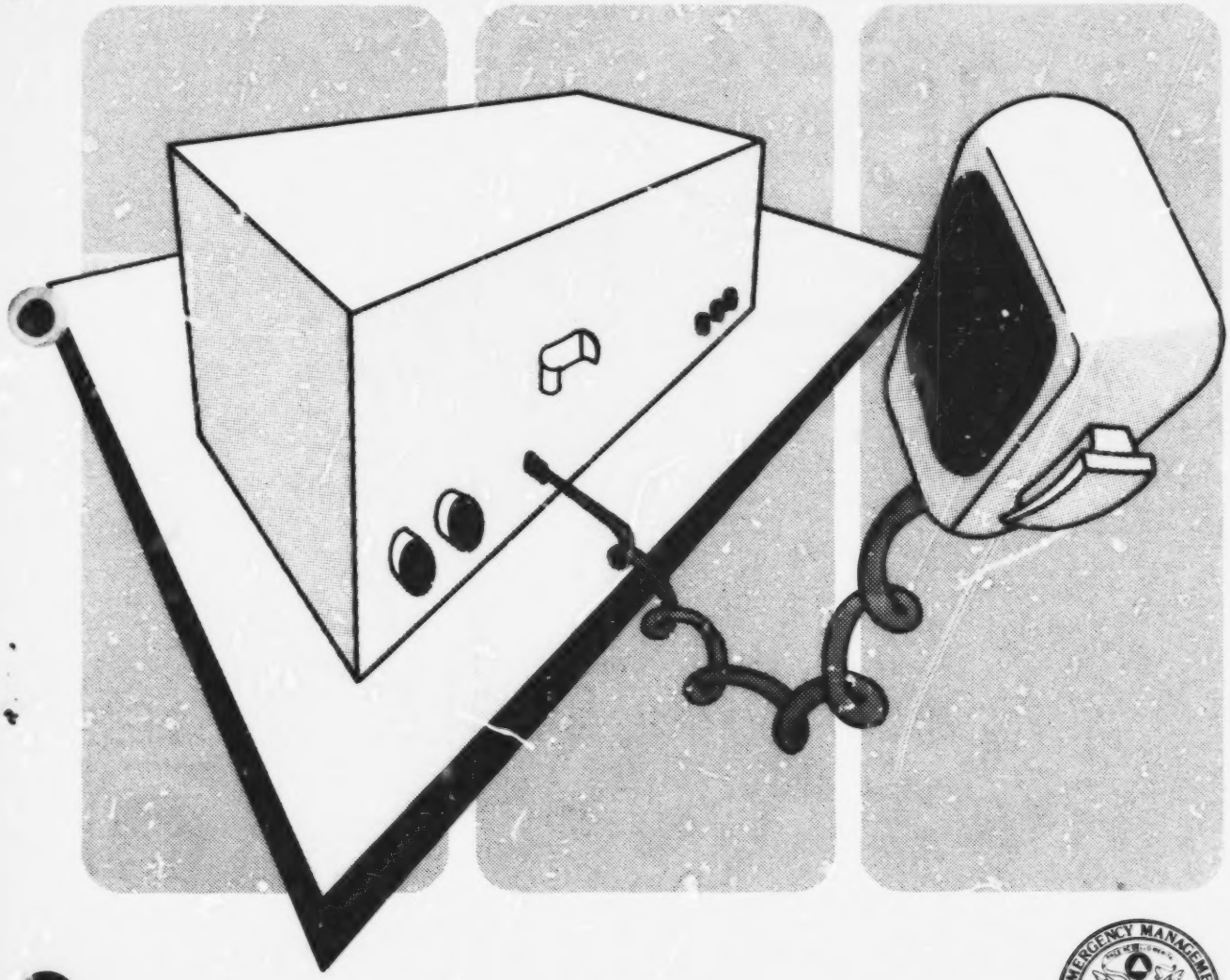
SEP 17 1988

FEM 1.8/2:2-13P

FEDERAL EMERGENCY MANAGEMENT AGENCY CPG 2-13P / April 1986

Maintenance Manual
Fixed Station Transmitters and Receivers



ORIGINAL

COMPLETED

MAINTENANCE MANUAL

FIXED STATION
TRANSMITTERS AND RECEIVERS

Federal Emergency
Management Agency

Maintenance Manual
Fixed Station Transmitters and Receivers

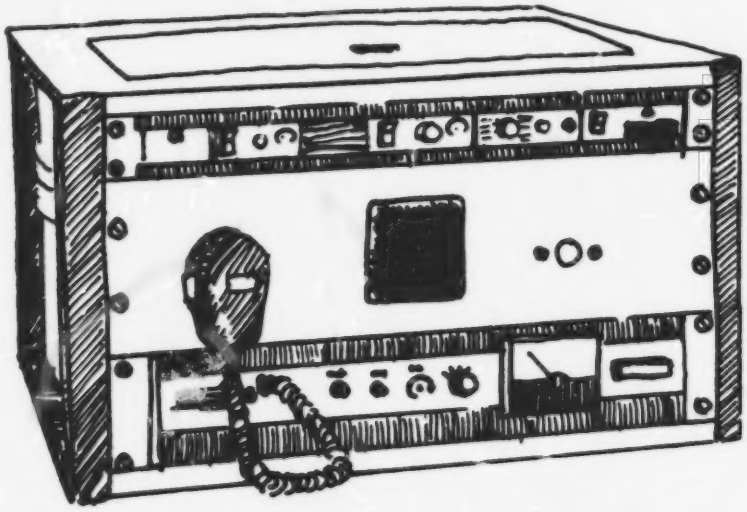
Introduction

The purpose of this manual is to guide you on how to maintain the fixed station transmitters and receivers. The information in this manual is only a **supplement** to the recommended maintenance information supplied in the service manuals provided by the manufacturers of the equipment. **Always follow the maintenance procedures provided in the manufacturer's manuals.** This manual will help you understand why maintenance is necessary. This manual will also be helpful if the manufacturer's maintenance manuals are not immediately available.

Description of Fixed Station Transmitters & Receivers

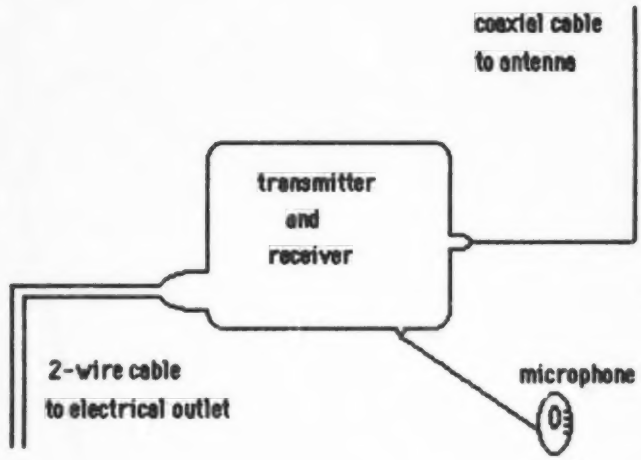
A fixed station transmitter and receiver is a permanently installed radio station, used to communicate with other similar fixed stations or with mobile units. The station consists of a transmitter and receiver (physically packaged in one or two units), operating controls, speaker, external microphone, and antenna system (see figure 1).

Figure 1



Power is usually obtained through a cable from an electrical outlet (see figure 2).

Figure 2



Base-station transmitters are available in rf-power-output ratings ranging from less than 3 watts to 330 watts or more. Most fixed station transmitters used by emergency management personnel will have a rating of 100 watts and above. Ordinarily, transmitters that are stations can be higher powered than in mobile applications, because space and power consumption are not as limiting, and because mobile-unit receiving conditions are variable and often poorer than the conditions at the base station.

Most fixed station radio equipment on the market is fully solid state, which means that no tubes are used. Some relatively high-power transmitters employ a quick-heating tube in the final rf amplifier stage.

Preventive Maintenance

To ensure that your base station transmitter and receiver works in an emergency, a program should be developed where you **regularly check the units to spot small troubles before they become big problems.** A program of coordinated monthly, semiannual and annual maintenance checks prevent serious problems from suddenly happening.

Routinely clean all the units. Check for frayed connections and loose bolts and parts; inspect the antennas. These are not normally mentioned in manufacturer's manuals, but can lead to more serious problems.

Equipment and Spare Parts

Only ordinary mechanical and electrical tools are needed to perform most maintenance on this equipment. You may also need a multimeter to correct some specific problems.

Maintain a list of spare parts. If your equipment is solid-state, these units will have few user serviceable parts. It may be more cost effective to replace the entire unit rather than try to locate a specific problem within the unit. The following table gives you an example of a list of spare parts for a transmitter and receiver.

Spare Parts: Base Transmitter & Receiver

Names of parts	Quantity
fuse	2
recommended connectors	10
rf amplifier tube (if used)	1
assorted nuts and bolts	

Safety

Follow safety precautions outlined in maintenance manuals supplied by the manufacturer. The circuits of base station transmitters and receivers can contain high levels of voltage that are potentially dangerous. Only a qualified electronics technician should attempt to repair any serious electrical problems.

Maintenance Checks: As Required

1) Inspect all terminal boards for loose connections and cracks. Tighten loose connections and replace damaged terminal boards.

2) Inspect all cable connectors for cracked sockets, proper locking, and corrosion. Replace damaged connectors.

3) Operate all component slides. Slides should operate smoothly without excessive noise or binding.

4) Check for noisy blower operation.

5) See that all air filters are in place and clean. Replace and/or clean air filter as necessary.

Monthly Maintenance Checks

1) Clean the radio set.

a) Remove moisture and loose dirt with a clean, soft cloth.

b) Remove grease, fungus, and ground-in dirt from the exterior surface. If dirt is difficult to remove, dampen the cloth with water and use mild soap (if necessary). Wipe dry with a clean, dry, lint-free cloth.

c) Clean the front panel and controls, using a clean, soft cloth. If dirt is difficult to remove, dampen the cloth with water and use mild soap.

2) See that screened opening at the top of the cabinet assembly is free from obstructions.

6-Month Maintenance Checks

1) Using manuals supplied by manufacturer, see that equipment is complete and properly installed.

2) Check all surfaces for evidence of fungus. Remove rust and corrosion. Paint bare spots.

3) Examine radio frequency interference gaskets (RFI) for broken, cracked, loose, pinched, mismatched, or missing sections.

4) Check for shorted, improperly installed, loose, dirty, bent, or broken interlocks.

5) Examine mounting of units. See that all bolts, nuts, and washers are properly tightened. Check for cracked, bent, or broken brackets.

6) See that the cable harnesses are properly bound and clamped in place. Check cable insulation for cracking, fraying, or other evidence of damage. Check operation of cable retractors to be sure that they work smoothly without binding.

6-Month Maintenance Checks (cont.)

8) Pull out each component from the cabinet assembly and be sure its top and bottom covers are mounted securely. Replace missing bolts and other mounting hardware.

9) Check the exterior panels on the top, bottom, right side, and left side of the cabinet assembly to see that they are mounted securely. All mounting hardware must be in place. Replace missing hardware.

10) Inspect all components, assemblies, and parts for damage or deterioration. Check for burnt resistors, charred insulation, and leaky capacitors. Replace all damaged or deteriorated assemblies and parts.

11) Perform frequency converter, synthesizer, & audio monitor circuit tests, for those circuit test switch positions which are not green area indications.

12) Perform linear power amplifier circuit tests for those multimeter switch positions which are not green area positions.

13) Check back up battery supply (if used) for corrosion and proper operating.

Corrective Maintenance: Troubleshooting

Some equipment malfunctions may be discovered during inspection or use of the transmitter and receiver. Perform the tests on the following tables to locate, and possibly correct, the problem.

PLEASE NOTE: This manual does not attempt to list all possible malfunctions that could occur nor can we suggest all possible remedies. Consult the manufacturer's manuals if a malfunction is not listed or it is not corrected by a prescribed procedure.

Corrective Maintenance: Fixed Station Transmitters & Receivers (Part 1 of 4)

Malfunction	Possible Cause	Recommendation
1. Unit does not operate; power light does not glow	■ burned out fuse	■ replace fuse
	■ defective on-off switch	■ if voltage is not present with on/off switch in either position, switch
	■ pilot light	■ replace old bulb
	■ open power cable	■ check voltage with volt ohm, meter (VOM); if voltage, check & repair cable
	■ no power	■ check power supply
2. Unit does not operate; power light glows	■ short within power circuit	■ if no voltage, replace unit with spare
	■ short within unit	■ check ammeter; if current is higher than rated, replace unit with spare
	■ input voltage polarity reverse	■ check with VOM; if polarity reversed, transpose input leads. If unit does not operate because it has been damaged, replace radio.
3. Radio set does not tune to desired frequency	■ defective radio set	■ remove & replace radio set

Corrective Maintenance: Fixed Station Transmitters & Receivers (Part 2 of 4)

Malfunction	Possible Cause	Recommendation
4. Unit transmits, but does not receive	■ squelch set too tight	■ adjust squelch control through entire range; disable tone squelch if used.
	■ defective rf amplifier tube (if used)	■ try new tube. If operation not restored, replace unit.
	■ defective relay	■ Short antenna & receiver input contacts. If operation restored, burnish & adjust relay contacts.
5. Unit receives but does not transmit	■ PTT switch defective or mike cable open	■ try new mike or short PTT terminals at mike receptacle with test head. Monitor transmitter output with an rf wattmeter or field strength meter. If operation restored, replace mike with spare or repair PTT switch or mike cable.
	■ low power	■ check power supply

*U.S. GOVERNMENT PRINTING OFFICE: 1986 O-154-820

Corrective Maintenance: Fixed Station Transmitters & Receivers (Part 3 of 4)

Malfunction	Possible Cause	Recommendation
6. Operator controls do not work properly	■ defective radio set or loose knobs	■ a. check knobs for tightness; tighten or replace as necessary. 1) tighten the set-screws that engage flat'ened shaft & collar b. remove and replace the radio set if necessary
7. Radio set inoperative (no sidetone or signals heard)	■ primary power circuit breaker or fuse open. Electrical connector not properly mated.	■ check primary circuit breaker or fuse, or radio set fuse; reset or replace. Check electrical connection for proper mating. Remove & replace radio set if necessary.
8. Excessive hum heard while receiving	■ radio set defective.	■ remove and replace radio set if necessary
9. Squelch does not operate properly	■ squelch control improperly adjusted.	■ adjust squelch. remove & replace radio set if necessary.

Corrective Maintenance:
Fixed Station Transmitters & Receivers (Part 4 of 4)

Malfunction	Possible Cause	Recommendation
10. radio set will transmit but not receive	■ squelch improperly set. Interphone system defective.	■ adjust squelch. Check interphone system. Remove & replace radio set if necessary.
11 .radio set works on some frequencies but not on others	■ radio set defective	■ remove & replace radio set
12. reception and transmission very weak.	■ antenna system or radio set defective	■ check antenna cable and connectors at back of radio & at antenna. Replace radio set if necessary.